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ABSTRACT

The supply, demand, and shortages of registered nurses (RNs) were projected and analyzed for 2000-2020. According to the analysis, the national supply of full-time-equivalent registered nurses in 2000 was estimated at 1.89 million versus an estimated demand of 2 million, leaving a shortage of 110,000 (6%). The shortage is expected to grow relatively slowly until 2010, when it will have reached 12%. Demand will then begin to exceed supply at an accelerated rate, with the shortage reaching 20% by 2015. If the problem is not addressed and if current trends continue, the shortage is projected to increase to 29% by 2020. Factors driving the growth in demand for RNs include an 18% increase in population, a larger proportion of elderly persons, and medical advances that increase the need for nurses. The projected growth in supply is expected to reach a peak of only 10% by 2011 and then begin to decline as the number of RNs leaving the profession exceeds the number entering it because of the aging of the RN workforce and projected declines in RNs' relative earnings. Seven tables detailing national and state supply, demand, and shortage projections and discussions of the Nursing Demand Model and Nursing Supply Model are appended. (Contains 11 charts/maps.) (MN)

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Projected Supply, Demand, and Shortages of Registered Nurses: 2000-2020

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July 2002

U.S. Department of Health and Human Services
Health Resources and Services Administration
Bureau of Health Professions
National Center For Health Workforce Analysis

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Projected Supply, Demand, and Shortages of Registered Nurses: 2000-2020

Introduction: The Health Resources and Service Administration, Bureau of Health Professions, National Center for Health Workforce Analysis ("National Center") is the primary Federal agency responsible for providing information and analysis relating to the supply and demand for health professionals. In support of this role, the National Center has recently assumed responsibility from the Bureau's Division of Nursing for conducting the quadrennial National Sample Survey of Registered Nurses and developing supply and demand projections for registered nurses. Supply and demand projections of registered nurses (RNs) for the period 2000 through 2020 are the subject of this report.[1] Using data on supply trends drawn from the 2000 National Sample Survey of Registered Nurses, these new projections show that a shortage of FTE registered nurses, previously projected to begin around 2007, was already evident in the year 2000.

This report consists of three sections. The first presents the National Center's projections of RN supply and demand, both national and State-specific, for the years 2000 through 2020. The second identifies and discusses the driving forces and trends underlying the projected supply; the third does the same for the projected demand. Relevant charts, maps, and tables are presented both in the body of the report and in an Appendix.

National Supply and Demand Projections

In 2000, the National supply of FTE registered nurses was estimated at 1.89 million while the demand was estimated at 2 million, a shortage of 110,000 or 6 percent. Based on what is known about trends in the supply of RNs and their anticipated demand, the shortage is expected to grow relatively slowly until 2010, by which time it will have reached 12 percent. At that point demand will begin to exceed supply at an accelerated rate and by 2015 the shortage, a relatively modest 6 percent in the year 2000, will have almost quadrupled to 20 percent. If not addressed, and if current trends continue, the shortage is projected to grow to 29 percent by 2020. These numbers are shown in Table 1 of the Appendix.

The projected shortage in 2020 results from a projected 40 percent increase in demand between 2000 and 2020 compared to a projected 6 percent growth in supply. Demand will grow steadily at a rate of 1.7 percent annually, a relatively modest growth rate when compared to the 2.3 percent annual growth in demand projected by the Department of Labor's Bureau of Labor Statistics. Factors driving the growth in demand include an 18 percent increase in population, a larger proportion of elderly persons, and medical

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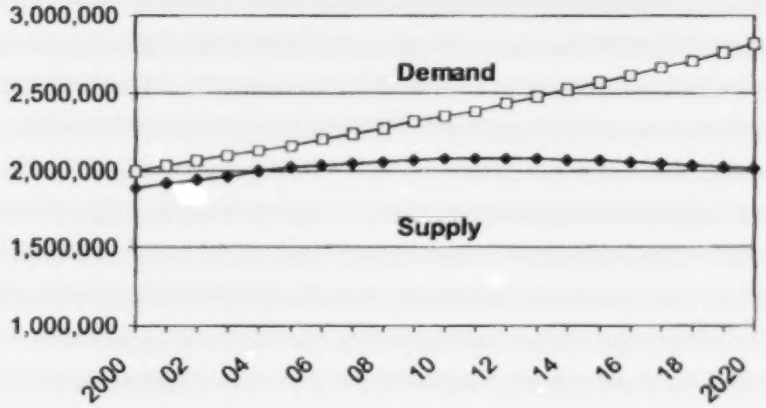
[1] Both supply and demand are defined in this report in full-time equivalent (FTE) terms. Full-time equivalency provides an unequivocal measure of the number of nurses that would be needed (in the case of demand) or available (in the case of supply) if everyone worked full-time. There were 2.2 million employed nurses in the United States in 2000, some of whom worked part-time. In FTE terms, that would be the equivalent of approximately 1.9 million full-time RNs.

advances that heighten the need for nurses. In contrast, the projected growth in supply is expected to reach a peak of only 10 percent by 2011 and then begin to decline as the number of nurses leaving the profession exceeds the number that enter. **(See Chart 1)**

Chart 1: National Supply and Demand Projections for FTE Registered Nurses: 2000 to 2020



Source: Bureau of Health Professions, RN Supply and Demand Projections

Distribution of the RN Shortage:

The national shortage of RNs is not evenly distributed across States. In 2000, 30 States were estimated to have shortages. **(See Map 1)** Because of uncertainties in the estimation process, only States with shortages greater than 3 percent are identified as shortage States. Affecting the accuracy of State-specific supply and demand projections are situations where: (a) a State may have many local shortages yet overall have an adequate supply; (b) significant numbers of nurses commute across State boundaries to work; (c) jurisdictions like Washington, D.C. provide service to large populations from outside its boundaries; and (d) demand projection methodology inadequately accounts for the differences in nursing utilization patterns that may exist between States.

Map 1: States with Shortages of FTE Registered Nurses in 2000

3

☐ States with shortages ☐ States without shortages

By 2020, 44 States and the District of Columbia are projected to have shortages. **(See Map 2)** State-specific projections for the years 2000 through 2020 are found in Tables 2 through 6 of the Appendix.

Map 2: States with Projected Shortages of FTE Registered Nurses in 2020

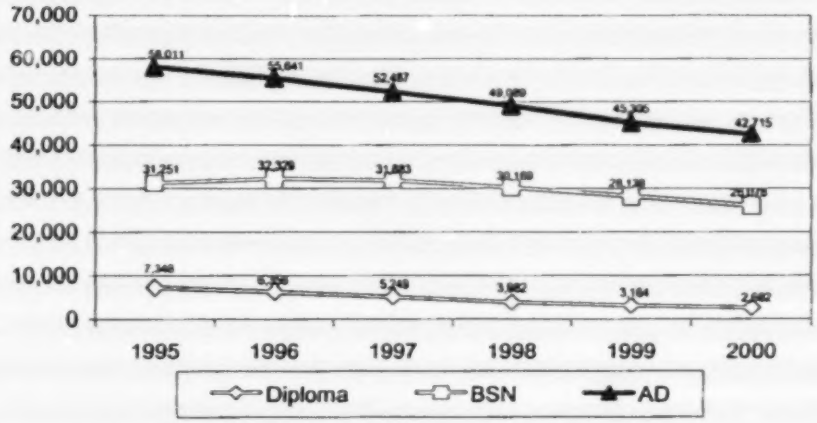
☒ States with shortages ☐ States without shortages

PROJECTED SUPPLY OF RNS—DRIVING FORCES AND TRENDS

An examination of factors affecting the supply of RNs sheds light on what has caused the current shortage. These factors include the declining number of nursing school graduates, the aging of the RN workforce, declines in relative earnings, and the emergence of alternative job opportunities.

***Declining numbers of nursing graduates*:**
Data on the growth in new RNs, as measured by those passing the RN licensing test (NCLEX), show that after growing steadily during the first half of the 1990s the number of new RN graduates fell annually in the last half of the decade, resulting in 26 percent fewer RN graduates in 2000 than in 1995. Declines were seen across all degree programs--diploma, associate degree, and baccalaureate. The decrease in diploma graduates continues a trend driven in the past few decades by the closing of hospital-based diploma programs. In contrast, the declines in associate degree and baccalaureate graduates are a more recent phenomenon, having occurred only since the mid-1990s. **(See Chart 2)** Further, due to declines in enrollments over the past 5 years, no increase in the number of graduates is expected in the short term. Although the American Association of Colleges of Nursing (AACN) did report a 4 percent increase in baccalaureate enrollment between 2000 and 2001, the relatively longer educational pipeline for baccalaureate students increases the length of time before licensed RNs will emerge.

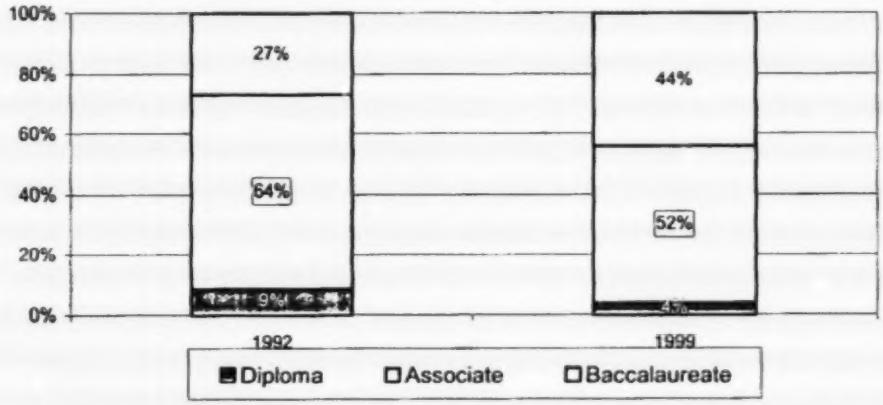
Chart 2: Total Number of RN Graduates by Degree Program, 1995-2000



Source: National Council of State Boards of Nursing, NCLEX

Associate degree graduates are declining at a somewhat faster rate than baccalaureate graduates, with the net result that baccalaureate graduates now comprise an increasingly greater share of total graduates. **(See Chart 3)**

Chart 3: Distribution of RN Graduates by Educational Preparation: 1992 and 1999



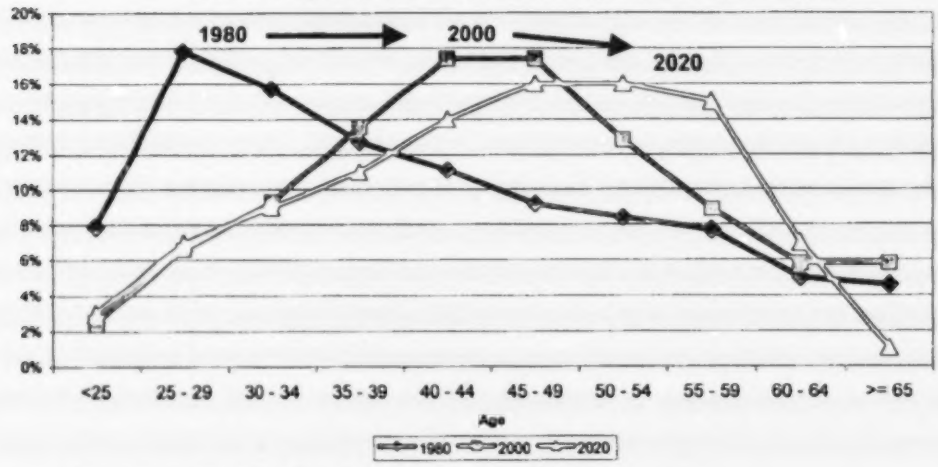
Source: National Council of State Boards of Nursing, NCLEX exam

This evolving shift from associate degree to baccalaureate-prepared RNs has, as noted earlier, a constraining effect on growth in supply. Baccalaureate-prepared RNs may need twice as long to complete their education and enter the workforce as those graduating from associate degree programs, thereby increasing the length of time needed for the average RN student to enter the workforce, thus creating a temporary hiatus in the growth of supply.

***Aging of the RN Workforce*:**

The average age for RNs has climbed steadily in recent years resulting in a greater proportion of nurses in the older age brackets who are approaching retirement age. Three factors contribute to this aging of the RN workforce: (1) the decline in number of nursing school graduates, (2) the higher average age of recent graduating classes, and (3) the aging of the existing pool of licensed nurses. Graduates of associate degree programs, the largest source of new RNs, are on average 33 years old when they graduate, considerably older than in 1980 when the average age of a new associate degree graduate was 28. The result has been a significant decline in the proportion of RNs under the age of 30. Between 1980 and 2000, that proportion declined from 25 percent to 9 percent. **(See Chart 4)** This slowing of new, young entrants coupled with an accelerating retirement rate for older RNs will produce a national supply of nurses that in 2020 will not only be older but no larger than the supply projected for 2005. The number of new licenses in nursing is projected to be 17 percent lower in 2020 than in 2002, while the loss from the RN license pool due to death and retirement is projected to be 128 percent higher.

Chart 4: Age Distribution of RNs: 1980, 2000 and 2020 Projected

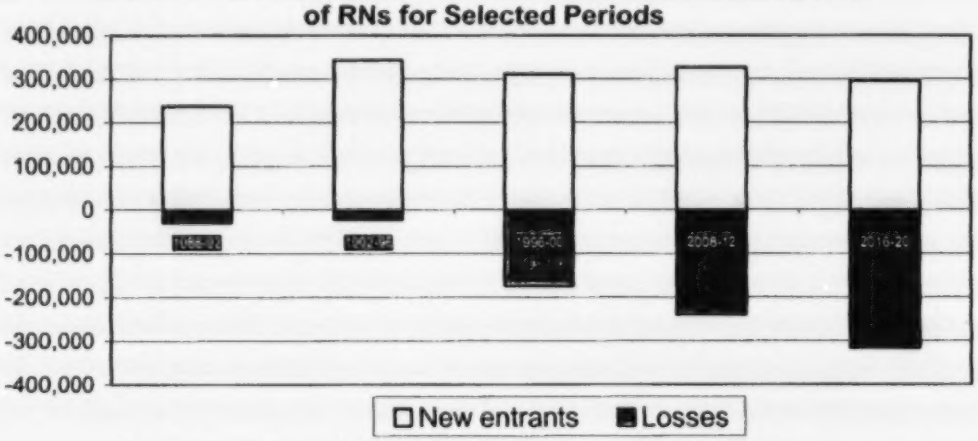


Source: Bureau of Health Professions, RN Sample Survey and Supply Projections.

In addition to the slower rate at which RNs were added to the workforce in the last half of the 1990s, they now appear to be leaving the RN license pool, through death or retirement, at a faster rate than ever. Over the four-year periods between the 1988 and

1992 surveys and the 1992 and 1996 surveys, the number of RNs leaving the license pool actually declined, from roughly 30,000 in the first four-year period to 23,000 in the second. Balancing these losses with the number of new graduates in each of these periods raised the RN license pool in those periods by 10 percent and 14 percent respectively. However, between the 1996 and 2000 surveys, the loss of RNs from the license pool increased six- to seven-fold, to nearly 175,000. **(See Chart 5)** Balancing this most recent set of losses with new graduates resulted in an increase in the RN license pool of only 5 percent, one-third to one-half the increase seen in the earlier surveys. If current projections hold, the situation will worsen as the number of losses approaches and then exceeds the number of new entrants. After balancing projected losses against projected new entrants, the RN supply is projected to grow 1.3 percent between 2008 and 2012, and by the end of the projection period, to decline by 1.9 percent between 2016 and 2020.

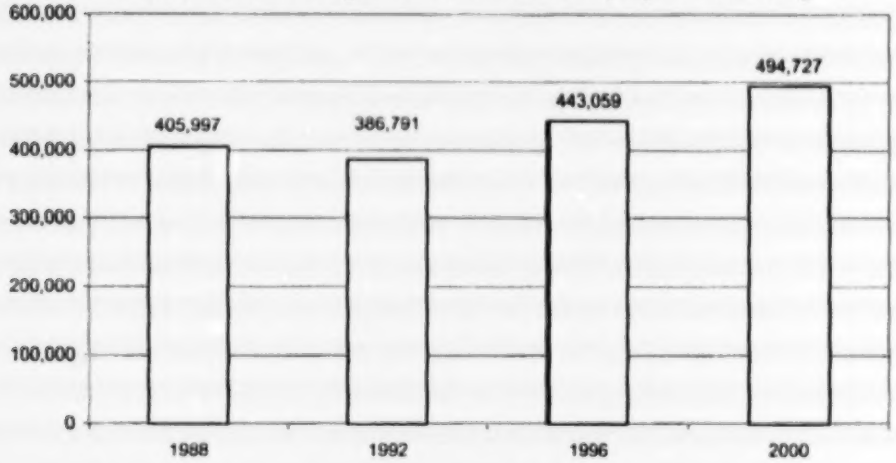
Chart 5: New Entrants and Losses From the Licensed Pool of RNs for Selected Periods



Source: Bureau of Health Professions, RN Sample Surveys and supply projections.

In addition to the number of RNs who give up their license, there are currently almost half-a-million licensed nurses not employed in nursing. Between the 1996 and 2000 surveys, the number of licensed RNs not employed in nursing grew by 52,000 to over 490,000 **(See Chart 6)**. Unfortunately, little is known about this population. However, what is known is that 69 percent, or 338,000, of the 490,000 licensed RNs not employed in nursing in 2000 were 50 years or older. Further, analysis of data from the 2000 RN Sample Survey shows that only 7 percent of the licensed RNs not employed in nursing were actively seeking employment in nursing.

Chart 6: Licensed Registered Nurses Not Employed in Nursing



Source: Bureau of Health Professions, RN Sample Surveys, various years.

Declines in Relative Earnings:

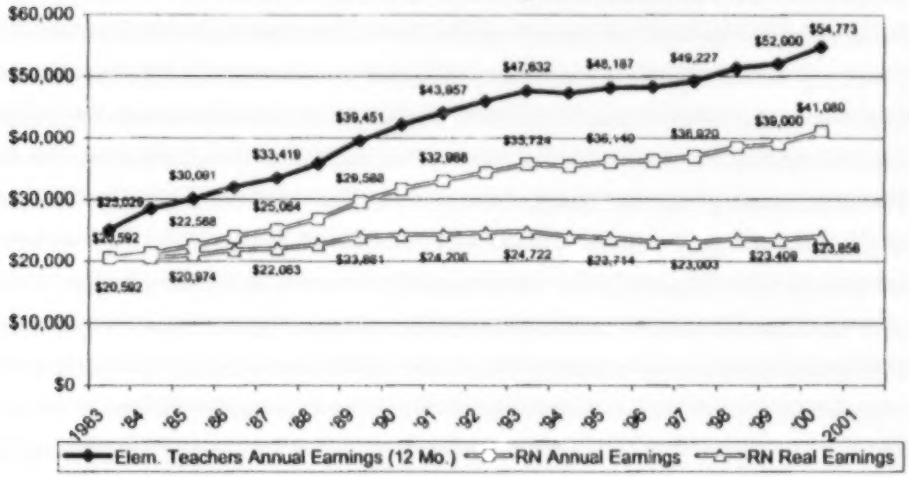
Salaries are likely playing a role in the declining supply of RNs. While actual earnings for RNs increased steadily from 1983 through 2000, "real" earnings -- the amount available after adjusting for inflation -- have been relatively flat since 1991. Thus, on average, RNs have seen no increase in purchasing power over the last 9 years. **(See Chart 7)** In contrast, the average salary for elementary school teachers has always been greater than that for RNs and is growing at a faster pace.[2] In 1983, the average elementary school teacher earned about $4,400 more than the average RN; by 2000 this had grown to the point where elementary school teachers earned about $13,600 more.[3]

Furthermore, a good portion of the wage growth for these nurses appears to occur early in their careers, then taper off with time. In 2000, staff RNs employed full-time in nursing, who graduated 5 years earlier, typically earned wages 15 to17 percent higher than those newly entering the field, depending on basic nursing preparation, but only 1 to 3 percent less than nurses who graduated 15 to 20 years earlier. As their potential for increased earnings diminishes over time, staff nurses may be motivated to leave patient care for additional education and/or other careers in nursing or outside the profession.

[2] BHPr adjusted the normal 9-month salary of elementary school teachers to its 12-month equivalent.

[3] Elementary school teacher is an alternative career choice normally available to baccalaureate-prepared RNs.

Chart 7: Actual Annual Earnings for RNs and Elementary School Teachers and "Real" Earnings for RNs: 1983-2000



Source: Bureau of Labor Statistics, Current Population Survey

PROJECTED DEMAND FOR REGISTERED NURSES-DRIVING FORCES AND TRENDS

The major factors and trends behind the growth in RN demand include: population growth, aging of the population, increased per capita demand for health care, and trends in health care financing.

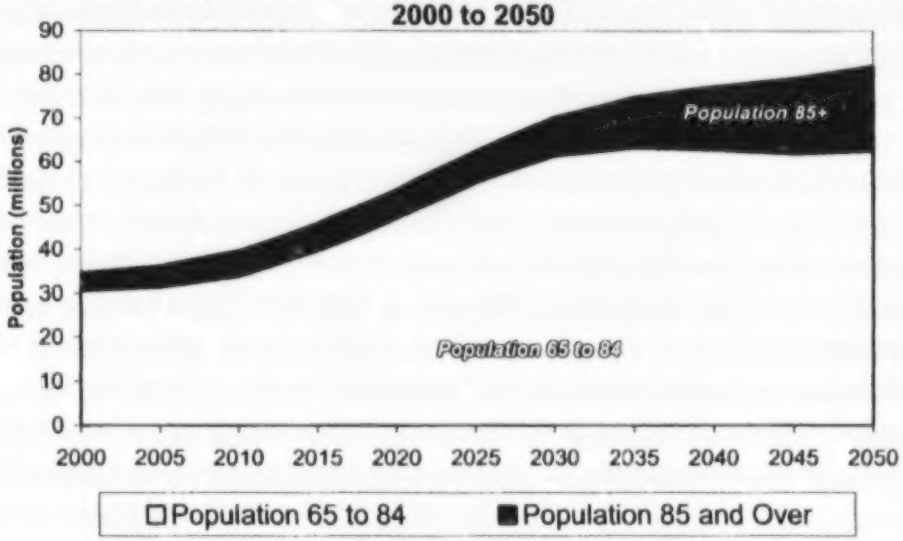
Population Growth and Aging:

The changing demographic nature of the population is a critical factor affecting demand for RNs. Recent projections show the Nation's population will grow 18 percent between 2000 and 2020, resulting in an additional 50 million people who will require health care. Much of this population growth can be attributed to advances in science and medicine that have increased life expectancy and resulted in a higher proportion of the population being over the age of 65, a significant source of demand for RNs.

In contrast to the 18 percent growth in overall population, the subgroup 65 years old and older is projected to grow 54 percent between 2000 and 2020, adding 19 million people to the 65-and-over age group. **(See Chart 8)** While this amount is less than the 31 million added to those under 65, individuals in the upper age brackets contribute disproportionately to health care spending, spending over 3 times as much on average as those under 65. Individuals 65 and over have a high incidence of chronic conditions such as: arthritis (50 percent), hypertension (36 percent), and heart disease (32 percent). Many also have multiple conditions requiring more regular care. The result is a population that currently has twice as many contacts with a physician as those under 65, accounts for 13 percent of the population but 38 percent of hospital discharges, and has annual per capita

health care expenditures of $5,400 compared to $1,500 for those under 65.[4] The greatest per capita demand for health care, and thus the services of RNs, will quite naturally come from the very old, those 85 and over. This is the fastest growing segment of the population and a major user of long-term care facilities, home health care, and other employers of RNs.

Chart 8: Population Projections 65 to 84 and 85 and over: 2000 to 2050



Source: U.S. Department of Commerce, Census Bureau.

Trends in Health Care Financing:

Demand for health care services, and by extension for registered nurses, is also driven by the ability to pay for health care, either with insurance or through out-of-pocket expenditures. Since 1990, an average of 85 percent of the population has been covered by some form of health insurance, making health care available to the vast majority of the population.[5] At the same time, real per capita disposable income has increased steadily, growing 16 percent between 1990 and 1999, making it easier to pay for non-covered health care with out-of-pocket resources, thereby increasing the demand for such care.[6] **(See Chart 9)**

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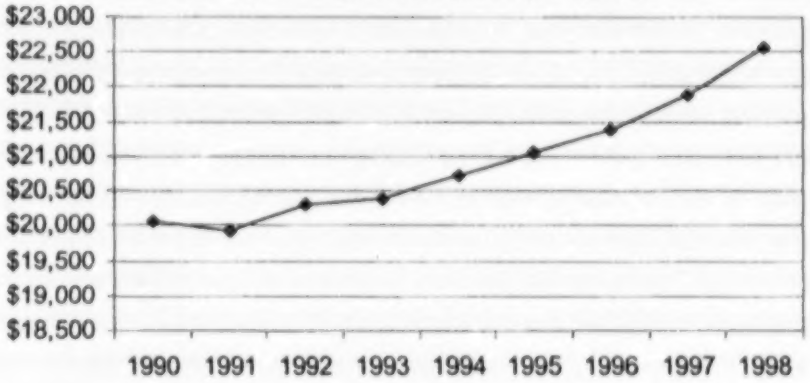
[4] Agency for Healthcare Research and Quality, "Data from the 1996 Medical Expenditure Panel Survey, (MEPS) Projected to 1999-2008: Medical Expenditures by Type of Service and Source of Payment for Age, Race and Sex", January 2002.

[5] 2000 Statistical Abstract p. 118, table No. 177.

[6] Disposable income is essentially the after-tax income available to persons for spending or saving.

Chart 9: Per Capita Disposable Personal Income in Constant (1996) Dollars



Source: U.S. Dept. of Commerce, Bureau of Economic Analysis

Distribution of Demand by Setting:

Between 2000 and 2020 the demand for RNs will continue to grow in all employment settings, but some will grow more rapidly than others, resulting in changes in the distribution of demand by setting. Hospitals have been and will continue to be the major source of demand for RNs but while the total number of nurses in hospitals will continue to grow, the hospital sector's share of total RN employment will remain stable at about 62 percent. **(See Table 7 in the Appendix)** Employment settings closely associated with service to the elderly are projected to increase their share of the total demand for RNs. For example, the demand for RNs in nursing homes is projected to increase from 8 percent of total demand in 2000 to 10 percent in 2020. Similarly, growth in the home health care sector will result in an increase in demand for RNs from 6.5 percent to 9 percent of total RN demand. These increases will naturally be offset by a corresponding decline in the proportion of demand in ambulatory and "other" settings.[7]

[7] "Other" settings include occupational nursing, nursing education, and school nurses.

APPENDIX

Table 1: National Supply and Demand Projections for FTE Registered Nurses; 2000 through 2020

State	Supply	Demand	Excess or Shortage (Supply Less Demand) (- = Shortage)	Percent Shortage
2000	1,889,243	1,999,950	-110,707	-6%
2001	1,912,667	2,030,971	-118,304	-6%
2002	1,937,336	2,062,556	-125,220	-6%
2003	1,959,192	2,095,514	-136,322	-7%
2004	1,989,329	2,128,142	-138,813	-7%
2005	2,012,444	2,161,831	-149,387	-7%
2006	2,028,548	2,196,904	-168,356	-8%
2007	2,039,772	2,232,516	-192,744	-9%
2008	2,047,729	2,270,890	-223,161	-10%
2009	2,059,099	2,307,236	-248,137	-11%
2010	2,069,369	2,344,584	-275,215	-12%
2011	2,075,891	2,379,719	-303,828	-13%
2012	2,075,218	2,426,741	-351,523	-14%
2013	2,068,256	2,472,072	-403,816	-16%
2014	2,061,348	2,516,827	-455,479	-18%
2015	2,055,491	2,562,554	-507,063	-20%
2016	2,049,318	2,609,081	-559,763	-21%
2017	2,041,321	2,656,886	-615,565	-23%
2018	2,032,230	2,708,241	-676,011	-25%
2019	2,017,100	2,758,089	-740,989	-27%
2020	2,001,998	2,810,414	-808,416	-29%

Limitations of Supply, Demand, and Shortage Projections:
Supply and demand projections at the State level should be carefully assessed. Estimates of supply and demand by State are to some extent biased by national averages and arbitrary State boundaries. In particular, demand may be underestimated for States that are rural and mountainous, have higher than average elderly populations, and utilize more RNs than the national average in their health care systems. Because the model averages the nurse staffing across 50 States, the projected demand increases for those States may be underestimated. Conversely, for States that utilize lower RN staffing ratios than the national average, demand estimates may be overestimated.

Also, State boundaries, especially for small States may bias the demand and supply estimates. Hospitals in the District of Columbia (DC), for example, serve Maryland and Virginia. Thus, estimating demand for RNs, based on current population in DC alone may underestimate the demand for RNs there. On the supply side, the same bias exists.

Table 2: Supply versus Demand Projections for FTE Registered Nurses by State--2000

State	2000 Supply	2000 Demand	Excess or Shortage (Supply Less Demand) (- = Shortage)	Percent Shortage
Alabama	30,987	31,902	-915	*
Alaska	4,264	4,465	-201	-5%
Arizona	28,575	34,559	-5,984	-17%
Arkansas	17,147	18,574	-1,427	-8%
California	154,002	166,665	-12,663	-8%
Colorado	26,556	29,735	-3,179	-11%
Connecticut	26,407	30,137	-3,730	-12%
Delaware	6,024	6,773	-749	-11%
District of Columbia	8,877	9,096	-219	*
Florida	112,735	115,928	-3,193	*
Georgia	49,746	53,357	-3,611	-7%
Hawaii	7,516	8,278	-762	-9%
Idaho	6,765	6,235	530	*
Illinois	87,457	86,097	1,360	*
Indiana	38,780	42,893	-4,113	-10%
Iowa	25,897	26,839	-942	-3.5%
Kansas	21,204	19,448	1,756	*
Kentucky	30,064	28,399	1,665	*
Louisiana	34,510	31,667	2,843	*
Maine	10,936	12,383	-1,447	-12%
Maryland	38,291	38,836	-545	*
Massachusetts	59,884	66,919	-7,035	-11%
Michigan	66,452	67,295	-843	*
Minnesota	37,357	38,704	-1,347	-3.5%
Mississippi	19,652	19,650	2	*
Missouri	47,337	51,418	-4,081	-8%
Montana	6,327	5,527	800	*
Nebraska	13,826	14,590	-764	-5%
Nevada	9,320	10,461	-1,141	-11%
New Hampshire	9,446	10,456	-1,010	-10%
New Jersey	56,868	65,260	-8,392	-13%
New Mexico	10,295	11,115	-820	-7%
New York	136,663	153,388	-16,725	-11%
North Carolina	62,427	61,798	629	*
North Dakota	5,779	5,769	10	*
Ohio	84,188	88,957	-4,769	-5%
Oklahoma	19,684	18,822	862	*
Oregon	21,498	22,347	-849	-3.8%
Pennsylvania	104,392	109,815	-5,423	-5%
Rhode Island	9,389	10,449	-1,060	-10%
South Carolina	25,877	25,981	-104	*
South Dakota	7,463	6,905	558	*
Tennessee	43,757	50,555	-6,798	-13%
Texas	116,252	127,661	-11,409	-9%
Utah	10,940	11,900	-960	-8%
Vermont	4,596	4,618	-22	*
Virginia	43,602	48,338	-4,736	-10%
Washington	33,486	36,862	-3,376	-9%
West Virginia	13,831	12,535	1,296	*
Wisconsin	38,498	36,241	2,257	*
Wyoming	3,417	3,349	68	*
TOTAL U.S.	1,889,243	1,999,950	-110,707	-6%

* No definitive shortage. Estimate is -3% or above.

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Table 3: Supply versus Demand Projections for FTE Registered Nurses by State--2005

State	2005 Supply	2005 Demand	Excess or Shortage (Supply Less Demand) (- = Shortage)	Percent Shortage
Alabama	32,606	34,422	-1,816	-5%
Alaska	3,645	5,023	-1,378	-27%
Arizona	31,395	39,507	-8,112	-21%
Arkansas	18,092	20,086	-1,994	-10%
California	162,645	181,054	-18,409	-10%
Colorado	29,676	33,911	-4,235	-12%
Connecticut	24,175	31,919	-7,744	-24%
Delaware	5,272	7,398	-2,126	-29%
District of Columbia	7,855	9,160	-1,305	-14%
Florida	120,285	128,983	-8,698	-7%
Georgia	50,374	59,199	-8,825	-15%
Hawaii	10,348	9,168	1,180	*
Idaho	5,772	7,246	-1,474	-20%
Illinois	89,830	90,521	-691	*
Indiana	40,741	46,036	-5,295	-12%
Iowa	29,489	28,406	1,083	*
Kansas	24,758	20,692	4,066	*
Kentucky	37,224	30,359	6,865	*
Louisiana	35,664	34,004	1,660	*
Maine	12,002	13,169	-1,167	-9%
Maryland	38,472	41,771	-3,299	-8%
Massachusetts	65,801	70,621	-4,820	-7%
Michigan	69,259	70,718	-1,459	*
Minnesota	44,200	42,247	1,953	*
Mississippi	21,667	21,205	462	*
Missouri	50,086	54,663	-4,577	-8%
Montana	6,795	6,258	537	*
Nebraska	14,316	15,723	-1,407	-9%
Nevada	10,424	12,275	-1,851	-15%
New Hampshire	10,684	11,504	-820	-7%
New Jersey	56,609	69,570	-12,961	-19%
New Mexico	9,509	12,595	-3,086	-25%
New York	146,211	158,851	-12,640	-8%
North Carolina	69,509	68,578	931	*
North Dakota	6,061	6,260	-199	-3.2%
Ohio	96,213	94,204	2,009	*
Oklahoma	19,163	20,411	-1,248	-6%
Oregon	22,433	25,116	-2,683	-11%
Pennsylvania	104,368	115,201	-10,833	-9%
Rhode Island	9,247	10,977	-1,730	-16%
South Carolina	27,739	28,388	-649	*
South Dakota	7,934	7,500	434	*
Tennessee	43,232	55,687	-12,455	-22%
Texas	131,897	142,102	-10,205	-7%
Utah	12,088	13,766	-1,678	-12%
Vermont	5,704	4,991	713	*
Virginia	45,079	52,777	-7,698	-15%
Washington	35,676	41,471	-5,795	-14%
West Virginia	13,862	13,124	738	*
Wisconsin	43,659	39,152	4,507	*
Wyoming	2,699	3,860	-1,161	-30%
TOTAL U.S.	2,012,444	2,161,831	-149,387	-7%

* No definitive shortage. Estimate is -3% or above.

Table 4: Supply versus Demand Projections for FTE Registered Nurses by State--2010

State	2010 Supply	2010 Demand	Excess or Shortage (Supply Less Demand) (- = Shortage)	Percent Shortage
Alabama	34,986	37,257	-2,271	-6%
Alaska	3,275	5,602	-2,327	-42%
Arizona	33,030	44,054	-11,024	-25%
Arkansas	18,700	21,803	-3,103	-14%
California	161,337	203,511	-42,174	-21%
Colorado	31,432	37,860	-6,428	-17%
Connecticut	22,422	34,158	-11,736	-34%
Delaware	4,886	7,922	-3,036	-38%
District of Columbia	7,635	9,720	-2,085	-21%
Florida	126,075	143,873	-17,798	-12%
Georgia	50,239	65,316	-15,077	-23%
Hawaii	12,110	10,189	1,921	*
Idaho	5,168	8,140	-2,972	-37%
Illinois	91,419	95,684	-4,265	-4%
Indiana	40,879	49,090	-8,211	-17%
Iowa	32,044	29,764	2,280	*
Kansas	27,248	22,087	5,161	*
Kentucky	42,297	32,516	9,781	*
Louisiana	37,534	36,831	703	*
Maine	12,440	14,204	-1,764	-12%
Maryland	37,287	45,059	-7,772	-17%
Massachusetts	65,937	75,033	-9,096	-12%
Michigan	68,797	74,285	-5,488	-7%
Minnesota	47,003	45,943	1,060	*
Mississippi	23,809	22,849	960	*
Missouri	51,634	58,309	-6,675	-11%
Montana	6,838	6,943	-105	*
Nebraska	14,561	16,912	-2,351	-14%
Nevada	10,931	13,493	-2,562	-19%
New Hampshire	11,312	12,588	-1,276	-10%
New Jersey	55,794	74,527	-18,733	-25%
New Mexico	9,037	14,144	-5,107	-36%
New York	149,487	166,690	-17,203	-10%
North Carolina	73,428	75,474	-2,046	*
North Dakota	6,139	6,755	-616	-9%
Ohio	105,255	99,405	5,850	*
Oklahoma	19,501	22,385	-2,884	-13%
Oregon	21,872	28,071	-6,199	-22%
Pennsylvania	103,426	120,492	-17,066	-14%
Rhode Island	8,552	11,608	-3,056	-26%
South Carolina	29,565	31,120	-1,555	-5%
South Dakota	8,117	8,049	68	*
Tennessee	42,033	61,083	-19,050	-31%
Texas	141,581	158,372	-16,791	-11%
Utah	12,617	15,508	-2,891	-19%
Vermont	6,265	5,367	898	*
Virginia	45,716	57,643	-11,927	-21%
Washington	35,998	46,691	-10,693	-23%
West Virginia	13,927	13,744	183	*
Wisconsin	45,373	42,060	3,313	*
Wyoming	2,421	4,402	-1,981	-45%
TOTAL U.S.	2,069,369	2,344,584	-275,215	-12%

* No definitive shortage. Estimate is -3% or above.

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Table 5: Supply versus Demand Projections for FTE Registerd Nurses by State--2015

State	2015 Supply	2015 Demand	Excess or Shortage (Supply Less Demand) (- = Shortage)	Percent Shortage
Alabama	36127	40,689	-4,562	-11%
Alaska	3005	6,197	-3,192	-52%
Arizona	33792	49,348	-15,556	-32%
Arkansas	18285	23,912	-5,627	-24%
California	153654	231,711	-78,057	-34%
Colorado	32135	42,159	-10,024	-24%
Connecticut	19841	36,786	-16,945	-46%
Delaware	4669	8,465	-3,796	-45%
District of Columbia	7546	10,450	-2,904	-28%
Florida	126257	162,616	-36,359	-22%
Georgia	49183	72,248	-23,065	-32%
Hawaii	13128	11,402	1,726	*
Idaho	4599	9,139	-4,540	-50%
Illinois	91032	101,944	-10,912	-11%
Indiana	40206	52,358	-12,152	-23%
Iowa	33642	31,468	2,174	*
Kansas	27704	23,759	3,945	*
Kentucky	44479	35,215	9,264	*
Louisiana	37594	40,177	-2,583	-6%
Maine	12114	15,486	-3,372	-22%
Maryland	35738	48,782	-13,044	-27%
Massachusetts	63816	80,595	-16,779	-21%
Michigan	67186	78,433	-11,247	-14%
Minnesota	47837	50,229	-2,392	-5%
Mississippi	25192	24,930	262	*
Missouri	51341	62,654	-11,313	-18%
Montana	6713	7,756	-1,043	-13%
Nebraska	14312	18,308	-3,996	-22%
Nevada	11426	14,798	-3,372	-23%
New Hampshire	11240	13,825	-2,585	-19%
New Jersey	53241	80,398	-27,157	-34%
New Mexico	8387	15,946	-7,559	-47%
New York	147852	176,911	-29,059	-16%
North Carolina	74546	83,414	-8,868	-11%
North Dakota	6110	7,341	-1,231	-17%
Ohio	109588	105,593	3,995	*
Oklahoma	19722	24,681	-4,959	-20%
Oregon	20536	31,576	-11,040	-35%
Pennsylvania	99517	127,301	-27,784	-22%
Rhode Island	7676	12,360	-4,684	-38%
South Carolina	30688	34,259	-3,571	-10%
South Dakota	7860	8,683	-823	-9%
Tennessee	40263	67,373	-27,110	-40%
Texas	146573	176,815	-30,242	-17%
Utah	12679	17,312	-4,633	-27%
Vermont	6589	5,813	776	*
Virginia	44711	63,157	-18,446	-29%
Washington	35150	52,722	-17,572	-33%
West Virginia	13849	14,574	-725	-5%
Wisconsin	43956	45,492	-1,536	-3.4%
Wyoming	2205	4,995	-2,790	-56%
TOTAL U.S.	2,055,491	2,562,554	-507,063	-20%

* No definitive shortage. Estimate is -3% or above.

Table 6: Supply versus Demand Projections for FTE Registerd Nurses by State--2020

State	2020 Supply	2020 Demand	Excess or Shortage (Supply Less Demand) (- = Shortage)	Percent Shortage
Alabama	36,309	44,662	-8,353	-18.7%
Alaska	2,859	6,822	-3,963	-58.1%
Arizona	33,780	55,519	-21,739	-39.2%
Arkansas	17,414	26,450	-9,036	-34.2%
California	142,978	263,673	-120,695	-45.8%
Colorado	32,310	47,028	-14,718	-31.3%
Connecticut	17,870	39,661	-21,791	-54.9%
Delaware	4,408	9,090	-4,682	-51.5%
District of Columbia	7,387	11,238	-3,851	-34.3%
Florida	123,904	185,050	-61,146	-33.0%
Georgia	47,939	79,982	-32,043	-40.1%
Hawaii	13,858	12,832	1,026	*
Idaho	4,219	10,325	-6,106	-59.1%
Illinois	87,975	109,334	-21,359	-19.5%
Indiana	38,326	55,912	-17,586	-31.5%
Iowa	34,385	33,615	770	*
Kansas	27,075	25,617	1,458	*
Kentucky	44,623	38,114	6,509	*
Louisiana	36,624	44,034	-7,410	-16.8%
Maine	11,719	16,930	-5,211	-30.8%
Maryland	33,892	52,846	-18,954	-35.9%
Massachusetts	60,983	86,365	-25,382	-29.4%
Michigan	64,426	82,729	-18,303	-22.1%
Minnesota	47,213	55,309	-8,096	-14.6%
Mississippi	25,972	27,414	-1,442	-5.3%
Missouri	50,523	67,547	-17,024	-25.2%
Montana	6,543	8,731	-2,188	-25.1%
Nebraska	13,917	19,952	-6,035	-30.2%
Nevada	11,847	16,333	-4,486	-27.5%
New Hampshire	11,007	15,073	-4,066	-27.0%
New Jersey	49,760	87,279	-37,519	-43.0%
New Mexico	7,792	18,056	-10,264	-56.8%
New York	144,129	188,740	-44,611	-23.6%
North Carolina	74,396	92,320	-17,924	-19.4%
North Dakota	6,132	8,053	-1,921	-23.9%
Ohio	108,559	111,693	-3,134	*
Oklahoma	19,615	27,359	-7,744	-28.3%
Oregon	19,124	35,653	-16,529	-46.4%
Pennsylvania	94,759	135,140	-40,381	-29.9%
Rhode Island	6,967	13,266	-6,299	-47.5%
South Carolina	31,034	37,775	-6,741	-17.8%
South Dakota	7,346	9,507	-2,161	-22.7%
Tennessee	38,391	74,596	-36,205	-48.5%
Texas	145,861	197,937	-52,076	-26.3%
Utah	12,407	19,332	-6,925	-35.8%
Vermont	6,792	6,313	479	*
Virginia	43,834	68,945	-25,111	-36.4%
Washington	34,295	59,746	-25,451	-42.6%
West Virginia	13,649	15,525	-1,876	-12.1%
Wisconsin	42,799	49,350	-6,551	-13.3%
Wyoming	2,072	5,640	-3,568	-63.3%
TOTAL U.S.	2,001,998	2,810,414	-808,416	-28.8%

* No definitive shortage. Estimate is -3% or above.

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Table 7: Employment Distribution by Setting

Year	Total	Hospitals	Nursing Homes	Public Health	Ambulatory Care	Home Health	Occupational Health	Nursing Education	School	Other
2000	1,999,950	1,242,831	168,529	95,360	160,911	130,288	20,040	45,815	57,638	78,537
2005	2,161,831	1,339,493	194,219	94,328	169,329	152,622	20,984	49,521	59,657	81,678
2010	2,344,584	1,451,083	223,193	93,226	178,272	177,583	21,826	53,640	60,419	84,872
2015	2,562,554	1,588,828	254,718	92,297	187,348	209,192	22,241	58,517	61,060	88,354
2020	2,810,414	1,741,639	291,513	91,360	196,399	248,848	22,390	64,055	62,244	91,966

Percentage Distribution by Setting

Year	Total	Hospitals	Nursing Homes	Public Health	Ambulatory Care	Home Health	Occupational Health	Nursing Education	School	Other
2000	100%	62.1%	8.4%	4.8%	8.0%	6.5%	1.0%	2.3%	2.9%	3.9%
2005	100%	62.0%	9.0%	4.4%	7.8%	7.1%	1.0%	2.3%	2.8%	3.8%
2010	100%	61.9%	9.5%	4.0%	7.6%	7.6%	0.9%	2.3%	2.6%	3.6%
2015	100%	62.0%	9.9%	3.6%	7.3%	8.2%	0.9%	2.3%	2.4%	3.4%
2020	100%	62.0%	10.4%	3.3%	7.0%	8.9%	0.8%	2.3%	2.2%	3.3%

Registered Nurse Demand Model (NDM)

The model used to project the demand for registered nurses is the Nursing Demand Model (NDM). The NDM combines empirical analysis with input from healthcare experts regarding how the health care system operates and the role of nurses in the delivery of care.

The NDM forecasts future demand for healthcare services in six settings: inpatient, outpatient, and emergency departments in general and short-term hospitals; non-general and long-term hospitals; nursing facilities; and home health.

The workload measures used to model demand for healthcare services are inpatient days (for inpatient settings in short-term hospitals and for long-term hospitals); visits (for short-term hospital outpatient and emergency department settings, and for home health); and nursing facility residents. Data limitations prevented the modeling of State-level estimates of the demand for ambulatory care in physician offices, occupational settings, at schools, and in public health clinics.

To forecast future healthcare demands of the population and where patients are likely to receive services, the NDM first divides the population into 32 subgroups based on age, sex, and urban or rural location. For each subgroup, the current national per capita use of health care services was estimated for each of the six delivery settings. The NDM then applies these national rates to each State's population to obtain initial estimates of demand for healthcare services at the State level. Then, the NDM multiplies this initial extrapolation of healthcare utilization with a scalar that inflates or deflates the initial extrapolation to incorporate the projected impact on utilization of trends in the healthcare operating environment, economic conditions, and the overall health of the population.

To forecast the level of nursing services that patients will require and the mix of nurses to provide those services, the NDM forecasts future nurse staffing intensity. Staffing intensity is defined in terms of FTE nurses per unit of healthcare services provided for the six delivery settings where future healthcare use is estimated (e.g., FTE RNS per 1,000 inpatient days at short-term hospitals). Staffing intensity is defined in terms of FTE nurses per population in the delivery settings where future healthcare use is not estimated (e.g., FTE RNs in public health per 10,000 population.) Forecasts of future nurse staffing intensity are based on extrapolations of current staffing intensity and take into account projected trends in the healthcare operating environment, in acuity, and in economic conditions that affect staffing intensity.

Twenty-four equations in the NDM quantify the relationship between healthcare utilization and its determinants and between nurse staffing intensity and its determinants. Twenty of these equations were estimated using multiple regression analysis with State-level data from 1996 through 2000, although most regression equations were estimated using a subset of these years based on data availability. Six equations describe the relationship between healthcare utilization and its determinants for the six healthcare settings modeled. Eighteen equations describe the relationship between nurse

requirements and its determinants for each nurse type in each setting modeled. In four ettings, poor data or poor regression results led to the decision to model future requirements using an alternative approach. RN and LPN requirements in the "all other" category are modeled as a fixed ratio of FTE nurses per population. RN requirements in the "school health" category are modeled as a fixed ratio of FTE RNs per population age 5-17. RN requirements in nurse education are modeled as fixed percentages of total RN requirements in the other 11 settings.

Nursing Supply Model

The model used to project the supply of registered nurses captures the age-specific dynamics of the flow of nurses in and out of licensure and the work force, their progression from one educational level to another, and their State-to-State migration. Data are developed for each State on: (1) the population of nurses - all those with licenses to practice on a given date; (2) the supply - all those employed or available for employment (if sufficient positions are not available at the time being considered); and (3) the full-time equivalent supply that expresses employment independently of full- or part-time status. The United States summary is an aggregation of the State data.

Projections of first-time licensees from United States schools are derived from projections of graduates. For these current projections of graduates from each of the three main types of basic nursing programs – diploma, associate degree, and baccalaureate - statistical regression models were used to determine those factors most likely to predict the numbers of graduates. Historical data on graduations, from the National League for Nursing annual surveys of schools of nursing, provided the trend information on the number of graduates from each type of program. Independent variables representing the availability and attractiveness of nursing as a career were considered for each of the models. These included measures of job availability, salaries, and health care expenditures. Also considered were data on the female population within the age groups found among nursing students and on the proportion of female high school graduates enrolling in higher educational institutions.

In order to capture the changes brought about by registered nurses taking additional education after their initial entry into nursing, statistical regression models were developed to project annual graduations from post-RN baccalaureate and master's degree programs. National League for Nursing annual survey data provided the historical data on graduations used in the models. Projections of graduations from post RN baccalaureate programs were based on graduations from basic AD and diploma programs and data from the National Sample Survey of Registered Nurses on the length of time between when nurses graduated from the generic program and the baccalaureate program. Similar variables on prior education graduations and intervening time were used in projecting post-RN master's degree graduates.

New licensees represent additions to the nurse population. Of critical importance to

determining the overall nurse population in any one year is a measure of those who no longer have licenses as registered nurses. Most of the population consists of those who have entered nursing over a period of years and have continued their licensure. Losses to the RN population occur through death, failure to renew licenses, or in some instances, disciplinary action that would revoke all licenses. The model accounts for deaths by using measures derived from the life tables of white females developed by the National Center for Health Statistics. However, there is no direct measure of nurses who failed to renew their licenses. Therefore, "net losses" are derived. They measure the net change in the RN population that is caused by those who drop all licenses minus those RNs who become relicensed after having dropped all their licenses.

To identify the supply of registered nurses, "activity rates" are developed using data from the National Sample Surveys of Registered Nurses on the proportion of the nurse population within a specific age group that is employed in nursing.

The derivation of the full-time equivalent RN supply was dependent upon data in the March 2000 National Sample Survey of Registered Nurses that identified the nurses working full-time and those working part-time and the number of scheduled hours for each nurse. A ratio was developed of the number of nurses within each age group cohort who were working on a full-time basis plus the full-time equivalent of those working on a part-time basis to the total number of working nurses. The full-time equivalent for part-time nurses was determined by the ratio of average scheduled hours of part-timers to average scheduled hours of full-timers.

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